

AMENDMENTS TO THE DRAWINGS

The attached drawing sheet includes changes to Figure 1. The replacement sheet, which includes Figure 1, replaces the original sheet including Figure 1. Changes incorporated in this sheet are indicated in red on the attached annotated copy of the original sheet.

Attachments: Replacement Sheet

Annotated Copy of Original Sheet

REMARKS

The Office Action of October 11, 2006 has been reviewed and the Examiner's comments carefully considered. The present Amendment amends claims 1 and 2. No new matter has been added by these Amendments. Support for these amendments can be found in the specification as originally filed. Accordingly, claims 1-6 are currently pending in this application, and claims 1, 2, 3 and 5 are in independent form.

Allowable Subject Matter

The Applicants would like to thank the Examiner for indicating that claims 3 and 5 are allowable over the prior art of record and that claim 2 is directed to allowable subject matter. Additionally, while claims 4 and 6 were not explicitly stated in the body of the Office Action as being allowable, these claims depend from allowable independent claims 3 and 5, respectively, and are listed on the Office Action Summary as "allowed".

The Examiner indicated that claim 2 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The present amendment amends allowable claim 2 to place it in independent form to include the limitations of independent claim 1. Accordingly, independent claim 2 is now in condition for allowance.

Drawing Objections

The drawings stand objected to because of minor informalities. Specifically, the Examiner has objected to Figure 1 because he contends that reference numeral 49 should read "PLL" instead of "PAL". The Applicants believe that the amendment to Figure 1 overcomes the Examiner's objections. Amendments to Figure 1 are indicated in red in the attached annotated copy of Figure 1. Reconsideration and withdrawal of this objection is respectfully requested.

35 U.S.C. §103 Rejections

Claim 1 stands rejected under 35 U.S.C. §103(a) for obviousness based upon Applicants' admitted prior art (hereinafter "AAPA") in view of United States Patent No. 5,798,631 to Spée et al. (hereinafter "the Spée patent"), and further in view of United States Patent No. 6,411,065 to Underwood et al. (hereinafter "the Underwood patent"). In

view of the above amendments and the following remarks, the Applicants respectfully request reconsideration of this rejection.

As defined by independent claim 1, the present invention is directed to an interconnecting power generation system connected in parallel to a utility power system for supplying electrical power to an interconnecting load. The interconnecting power generation system includes an interconnecting inverter for linking generated electrical power to the utility power system; a voltage phase shift circuit which synchronizes the output voltage phase of the interconnecting inverter with the utility power voltage phase and monitors zero crossings of said utility power voltage, and which, when a predetermined number of zero crossings have been detected, to detect a power outage actively, shifts the output voltage phase from the utility power voltage phase during one cycle and shifts the shifted output voltage phase to the utility power voltage phase during the following cycle; a circuit breaker for shutting off the output of the interconnecting inverter from the utility power system; a phase comparator for comparing the voltage phase of the utility power system and the output voltage phase of the interconnecting inverter; and an interconnection control unit which detects a power outage caused by an interruption of power supply from the utility power system based on a series of a predetermined number of matching signals outputted from said phase comparator and sends a control signal to the circuit breaker to shut off the output of the interconnecting inverter from the utility power system.

Additionally, an object of the present invention is to provide an interconnecting power generation system connected in parallel to a utility power system which can actively detect a power outage in a utility power supply, be isolated from the utility power system and prevent damage to a turbogenerator.

As the AAPA, the Examiner relies upon page 1 of the present disclosure. This portion of the disclosure describes that an interconnecting power generation system comprises an inverter apparatus for converting a DC output of a solar power generation system, for example, as a DC power source into an AC output and linking the DC power source to an AC utility power supply. A control unit for controlling the inverter apparatus has a detection circuit for detecting the phase voltage of the utility power supply, a detection circuit for detecting the output current of the inverter apparatus, an arithmetic circuit for calculating the error between signals indicating the phase voltage of the utility power supply and the output current of the inverter apparatus detected by the respective detection circuits,

and a driver circuit for controlling the switching of the inverter apparatus based on the output of the arithmetic circuit, and makes the output current outputted from the current-controlled inverter apparatus follow the phase voltage signal of the utility power supply so that a sine wave current coincident in phase with the voltage of the utility power supply can be outputted. The interconnecting power generation system thereby converts electrical power generated by a solar cell into AC electrical power. The Examiner contends that this portion of the Applicants' specification discloses the interconnecting inverter and voltage phase shift circuit of independent claim 1.

However, the AAPA does not teach or suggest a voltage phase shift circuit which detects a power outage actively. Generally, there are two ways to detect a power outage of an interconnecting power generator: a passive approach and an active approach. In the passive approach, independent operation can be detected by detecting a sudden change of the system, such as over-voltage/under-voltage, over-frequency/under-frequency, and voltage phase at which independent operation is entered. In this approach, however, when the generating power of the generator equals the consuming (or supplying) power of the load (active power and reactive power are balanced), the voltage and the frequency do not greatly change at a system isolation point and thus independent operation may not always be detected (i.e., there may be a dead band).

The present invention, on the other hand, utilizes an active approach. In such an active approach, the voltage and the frequency are fluctuating constantly, and fluctuate remarkably when independent operation is entered, thereby allowing reliable detection of independent operation even when the generating power of the generator equals the consuming power of the load.

Additionally, the Spée patent and the Underwood patent do not cure this deficiency. The Spée patent is directed to a variable speed, constant frequency (VSCF) system that utilizes a doubly-fed machine (DFM) to maximize the output power of the system, and is provided by the Examiner as allegedly teaching a voltage phase shift circuit that monitors zero crossings of the utility power voltage, and which, when a predetermined number of zero crossings have been detected, shifts the output voltage phase from the utility power voltage phase during one cycle and shifts the shifted output voltage phase to the utility power voltage phase during the following cycle. The Underwood patent discloses an integrated system for comprehensive control of an electric power generation system, and is

provided by the Examiner as allegedly teaching a circuit breaker, a phase comparator and an interconnection control unit as required by independent claim 1. However, these references do not teach or suggest a voltage phase shift circuit which detects a power outage actively.

Furthermore, independent claim 1 requires “a voltage phase shift circuit ... [that] monitors zero crossings of the utility power voltage, and which, when a predetermined number of zero crossings have been detected ... shifts the output voltage phase from the utility power voltage phase during one cycle and shifts the shifted output voltage phase to the utility power voltage phase during the following cycle”. The Examiner relies on the Spée patent as teaching this feature. However, while the Spée patent discloses a VSG system that utilizes a phase locked loop (PLL), and that the PLL can be implemented by grid voltage zero-crossing detection (see column 8, lines 6-18 of the Spée patent), this reference does not teach or suggest that when a predetermined number of zero crossings have been detected, the voltage phase shift circuit shifts the output voltage phase from the utility power voltage phase during one cycle and shifts the shifted output voltage phase to the utility power voltage phase during the following cycle.

Independent claim 1 also requires an interconnection control unit which detects a power outage caused by an interruption of power supply from the utility power system based on a series of a predetermined number of matching signals outputted from the phase comparator. The Examiner relies on the Underwood patent as teaching such a feature. However, while the Underwood patent discloses that a controller (200) capable of outputting a disconnect control signal to a contactor (K1) to control the connection of the generation facility to a utility grid (99), this reference does not teach or suggest a control unit for detecting a power outage caused by an interruption of power supply from the utility power system based on a series of a predetermined number of matching signals outputted from a phase comparator as required by independent claim 1.

Finally, under United States patent law, when the Examiner claims that a combination of references renders an invention obvious, the prior art must provide a suggestion or motivation to combine the references. Absent this suggestion or motivation, the mere existence of the individual elements at the time of invention does not render a patented combination of these elements obvious as a matter of law (see MPEP §2143.01). Additionally, it is impermissible to use the claimed invention as a template or guide to piece together the teachings of the prior art so that the claimed invention is rendered obvious.

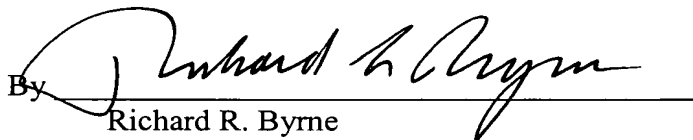
Accordingly, we do not believe that there is a disclosure, teaching or suggestion, nor has the Examiner pointed to any disclosure, teaching or suggestion, in the AAPA, the Spée patent and the Underwood patent, either individually or in combination, to combine their respective teachings to arrive at the invention of independent claim 1. The Examiner merely relies on a broad statement that such a combination would provide a "reliable means of detecting a phase difference between [the] power generation system and the utility power system, [and] also to have a safe and reliable means of connecting and disconnecting from the utility power when a failure in the power utility is detected" (see pages 4 and 5 of the Office Action).

For the foregoing reasons, the Applicants believe that the subject matter of amended independent claim 1 is not rendered obvious by the combination of the AAPA, the Spée patent and the Underwood patent. Reconsideration and withdrawal of the rejection of claim 1 is respectfully requested.

Based on the foregoing amendments and remarks, reconsideration of the rejection and allowance of amended independent claim 1, reconsideration of the objection to and allowance of amended independent claim 2, and the continued allowance of claims 3-6 are respectfully requested.

Respectfully submitted,

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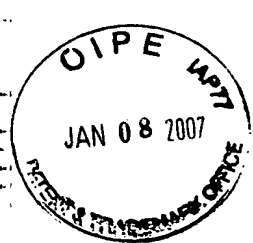


FIG. 1

